BLACK BOX®
NETWORK SERVICES

OCTOBER 2007
MT195A-T1
MT196A-E1

T1/E1 Link Extenders

CE

Important

This is a Class A device and is intended for use in a light industrial environment. It is not intended nor approved for use in an industrial or residential environment.

CUSTOMER SUPPORT INFORMATION Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: www.blackbox.com • E-mail: info@blackbox.com

CE NOTICE

We certify that the apparatus identified in this document conforms to the requirements of Council Directive 1999/5/EC on the approximation of the laws of the member states relating to Radio and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

RADIO AND TV INTERFERENCE

This equipment generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. This equipment has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the equipment causes interference to radio or television reception, which can be determined by disconnecting the cables, try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

FCC PART 68

This equipment complies with Part 68 of FCC rules and the requirements adopted by ACTA. On the bottom side of this equipment is a label that contains—among other information—a product identifier in the format US: AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

The method used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, please contact our company. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

INDUSTRY CANADA NOTICE

This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

This Declaration of Conformity means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above condition may not prevent degradation of service in some situations. Repairs to some certified equipment should be made by an authorized maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the ground connections of the power utility, telephone lines and internal metallic water pipe system, are connected together. This protection may be particularly important in rural areas.

COMPLIANCE

EMC

- FCC Part 15, Class A
- EN55022, Class A
- EN55024

SAFETY

- UL 60950-1/CSA C22.2 N0. 60950-1
- IEC/EN60950-1
- AS/NZS 60950-1

PSTN REGULATORY

- FCC Part 68
- CS03
- TBR12 & 13
- AS/ACIF S016:2001
- AS/ACIF S043:2003

SAFETY WHEN WORKING WITH ELECTRICITY

• This device contains no user serviceable parts. The equipment shall be returned to Black Box for repairs, or repaired by qualified service personnel.

• The external AC adaptor shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. Ensure that the AC power cable meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

• Do not work on the system or connect or disconnect cables during periods of lightning activity.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

TRADEMARKS USED IN THIS MANUAL

All applied-for and registered trademarks are the property of their respective owners.

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1. General Information

Thank you for your purchase of this Black Box product. If any questions arise during installation or use of the unit, contact Black Box Tech Support at (724) 746-5500.

1.1 Features

- Easy-to-install T1/E1 Extenders—*no configuration required*
- Data rates up to 2.048 Mbps in 64-kbps intervals
- Plug 'n' Play for easy installations
- LED indicators for Power, Ethernet Link, and Frame
- CE marked

1.2 Description

The Black Box T1/E1 Extenders provide high speed 2-wire T1/E1 extension connectivity to ISPs, PTTs, and enterprise environments using binder group friendly TC-PAM modulation.

Line connection is made with an RJ-45 jack. Models MT196A-E1 and MT195A-T1 are powered by an 100/230 VAC (Universal) supply. The NTU features externally-accessible DIP switches, loopback diagnostics, and Plug 'n' Play.

2. Installation

Because the T1/E1 Extenders require no configuration, they can be installed quickly. Installation consists of the following:

- Connect the power plug (refer to section 2.1, "Connecting Power" on page 10).
- Connect the line port (refer to section 2.3, "Connecting the Line Port" on page 11)

  Note See Figure 1 and Figure 2 for the rear-panel connectors locations.

- Connect the T1/E1 port (refer to section 2.4, "Connecting the Circuit Interface" on page 11).

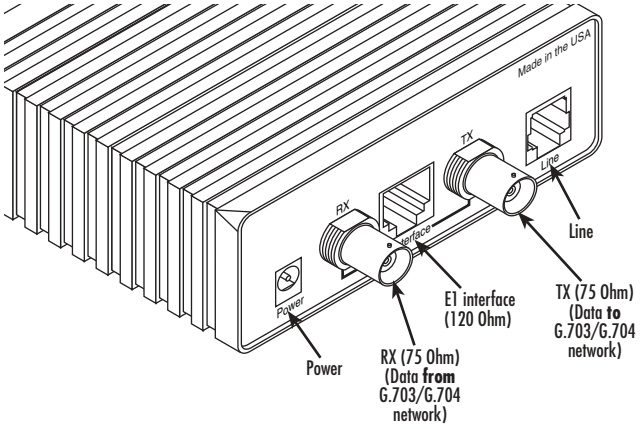

Figure 1. Model MT196A-E1 rear panel

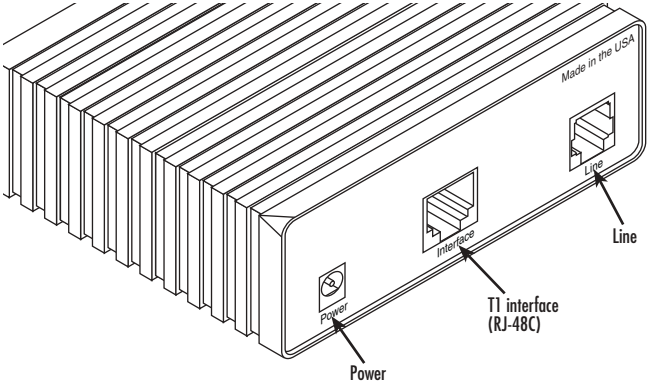

Figure 2. Model MT195A-T1 rear panel

2.1 Connecting Power

CAUTION

The external AC adaptor shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. Ensure that the AC power cable meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

Your T1/E1 Extender comes with an external AC adaptor with a detachable power cord.

To connect power to the T1/E1 Extender:

1. Connect the female plug of the AC power cord to the AC adaptor provided.
2. Connect the barrel-type connector of the AC adaptor to the Power connector on the T1/E1 Extender.
3. Insert the male plug of the AC power cord into the AC power outlet (100-240 VAC).
4. Verify that the Power LED on the front panel illuminates and remains lit.

2.2 Power Input Connector

The T1/E1 Extender comes with an AC power supply.

- The supplies connection to the T1/E1 Extender is a 2.5 mm barrel receptacle with the center conductor positive (see Figure 3).

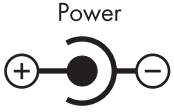

Figure 3. Power connection barrel receptacle diagram

- T1/E1 Extender's rated voltage: 5.0 VDC
- T1/E1 Extender's rated current: 1 A DC

2.2.1 External AC universal power supply

- Output from power supply: 5 VDC, 2A
- Input to power supply: universal input 100–240 VAC 50/60 Hz 0.3A

2.3 Connecting the Line Port

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Follow the steps below to connect the line port:

1. Obtain a single-twisted pair cable with an RJ-45 plug connector at each end.

2. Plug one end of the cable into the RJ-45 socket (labeled Line) on the T1/E1 Extender .

3. When the remote and local extender units synchronize, the front-panel Link LED will turn on.

2.4 Connecting the Circuit Interface

Your T1/E1 Extender comes with either an RJ-48C or an RJ-48C and dual BNC for connection to a T1 or E1:

- Model MT196A-E1 - E1: 120-Ohm RJ-48C and dual 75-Ohm BNC connectors

- Model MT195A-T1 - T1: RJ-48C

To connect the twisted pair cable to the T1/E1 port:

1. Attach the male connector of the twisted pair cable to the female RJ-48 connector on the T1/E1 Extender.

2. Attach the other end of the cable to the RJ-48 connector on the local T1 or E1.

Note When attaching the T1/E1 Extender directly to a T1/E1 circuit, a straight through twisted pair cable can be used. When attaching the MT196A-E1/R or MT195A-T1/R to a device, please use the enclosed T1/E1 cross over cable for proper operation.

Note The unit marked as MT196A-E1/L or MT195A-T1/L is configured by default to accept timing from the T1/E1 circuit. The MT196A-E1/R or MT195A-T1/R unit then recovers this timing from the line in order to ensure synchronization of the T1/E1 circuit over the extenders.

3. Operation

Once the T1/E1 Extenders are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

3.1 Front Panel LED Status Monitors

Models MT196A-E1 and MT195A-T1 feature three front-panel LEDs that monitor power, Ethernet signals, and the CopperLink connection. Figure 4 shows the front panel location of each LED. Table 1 describes the LED functions.

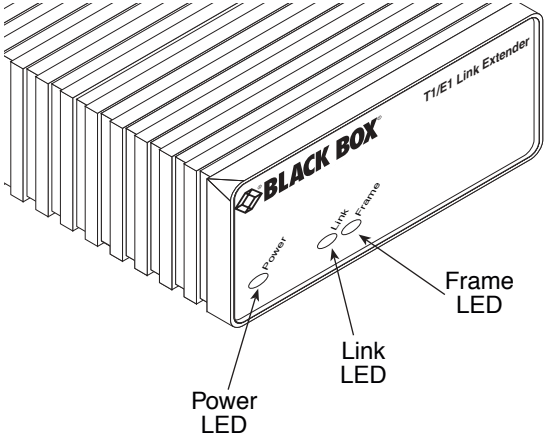

Figure 4. T1/E1 Extender front panel

Table 1: Front panel LED description

LED	Description
Power	When lit, indicates the unit is powered on
Link	On solid—link is connected Off—No signal detected Flashing — Data is being transmitted/received
Frame	On solid—T1/E1 frame is connected Off — No signal detected Flashing — Error detected

3.2 Configuration and Dip Switches

The T1/E1 Extenders are Plug 'n' Play enabled and do not require any configuration by the user.

Note The user **should NOT** change any of the dip switches except for S1-7 (if necessary). If the user changes the position of any of the dip switches (except for S1-7), it **will affect** the operation of the unit. Refer to Appendix B. on page 16 for the factory default dip switch configuration.

3.2.1 SWITCH S1-7: LINE BUILD OUT

Switch S1-7 defines the shape of the waveform on the T1 or E1 line.

Table 2: S1-7 Default Position

Switch	MT196A-E1/L/EUI	MT196A-E1/R/EUI	MT195A-T1/L/EUI	MT195A-T1/R/EUI
S1-7	OFF (120)	OFF (120)	ON (0.0dB)	ON (0.0dB)

A. Specifications

A.1 Circuit Rates

- **Model MT196A-E1** - 2.048 Mbps
- **Model MT195A-T1** - 1.544 Mbps

A.2 Circuit Interface

- E1 (Model MT196A-E1) presents G.703/G.704 interface. Either 75 Ohms (unbalanced) or 120 Ohms (balanced). Pins 1 & 2 are Receive. Pins 4 & 5 are transmit.
- T1 (Model MT195A-T1) present T1 interface. Pins 1 & 2 are Receive. Pins 4 & 5 are Transmit.

A.3 Circuit Defaults

- E1 Line Coding = HDB3.
- T1 Line Coding = B8ZS; Line Build Out Rx = Automatic; Line Build Out Tx = 0.

A.4 Circuit Connector

- Dual BNC and RJ48C (Model MT196A-E1), strap selectable
- RJ48C connector (Model MT195A-T1)

A.5 LED Indicators

- Three LED indicators: Power, Link, Frame

A.6 Power and Power Supply Specifications

- AC power supply
- Connection to the T1/E1 Extender requires +5VDC ±5% DC power (1.0A minimum). Center pin is +5V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./shaft length dimensions
- T1/E1 Extender's rated voltage: 5.0 VDC
- T1/E1 Extender's rated current: 1A DC

A.7 Environmental

- Temperature: 32–122°F (0–50°C)
- Relative Humidity: 5–95%, non-condensing
- Altitude: 0–15,000 ft (0–4,572 m)

A.8 Transmission Line

- Single Twisted Pair

A.9 Line Coding

- TC-PAM (Trellis Coded Pulse Amplitude Modulation)

A.10 Line Interface

- Transformer coupled, 2500 VRMS isolation

A.11 Line Physical Connection

- RJ-45, 2-wire polarity insensitive pins 4 and 5

B. Factory Default Dip Switch Configuration

Note This information is provided for informational purposes only. These settings should not be changed other than by instructions from Black Box Support, lest the unit be rendered inoperable.

B.1 Switch S1 - Factory Default configuration

Table 3: S1 Factory Default Dip Switch Configuration

Switch	MT196A-E1/L/EUI	MT196A-E1/R/EUI	MT195A-T1/L/EUI	MT195A-T1/R/EUI
Switch 1-1	ON	ON	ON	ON
Switch 1-2	ON	ON	ON	ON
Switch 1-3	ON	ON	ON	ON
Switch 1-4	ON	ON	OFF	OFF
Switch 1-5	ON	ON	OFF	OFF
Switch 1-6	OFF	OFF	ON	ON
Switch 1-7	OFF	OFF	ON	ON
Switch 1-8	ON	ON	ON	ON

B.2 Switch S2 - Factory Default Configuration

Table 4: S2 Factory Default Dip Switch Configuration

Switch	MT196A-E1/L/EUI	MT196A-E1/R/EUI	MT195A-T1/L/EUI	MT195A-T1/R/EUI
Switch 2-1	OFF	OFF	OFF	OFF
Switch 2-2	OFF	OFF	OFF	OFF
Switch 2-3	OFF	OFF	OFF	OFF
Switch 2-4	OFF	ON	OFF	ON
Switch 2-5	ON	OFF	ON	OFF
Switch 2-6	OFF	OFF	ON	ON
Switch 2-7	OFF	OFF	ON	ON
Switch 2-8	ON	ON	ON	ON

Notes

Notes

Notes

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